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Persuasive Research Essay

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The Most Important Class that Doesn’t Exist: Computer Science in Utah Classrooms

In a world where we hear a lot about unemployment it may be surprising to hear that there is a career where there are so many jobs needed that employers struggle to fill those jobs. This is exactly what is happening in the computer science field, especially in the state of Utah. Utah colleges only produce around 500 computer science graduates every year, yet there are over 7000 employers in Utah that are looking to hire computer science majors on a regular basis (“The Problem”). There is an obvious disconnect somewhere. This disconnect is happening in Utah high schools. Less than a third of Utah high schools even offer computer science courses. In order to bridge the gap, Utah high schools should require coursework in computer science to qualify for graduation. This will provide students with the experience necessary to succeed in computer science at a college level and encourage them to consider computer science as a career choice.

All throughout high school, the fact that we would eventually go to college and start a career was relentlessly beaten over our heads. Every year our student advisor would meet with us to remind us that we needed to be thinking about what we wanted to study. We would go to computer labs and research different careers and what the requirements were. Naturally, the first career that popped up was “doctor”. In the course of our investigation, teachers hovered overhead answering any questions about the various careers, but there was never any discussion about software developers or network analysts. It was well known to them that career decisions are often made in high school. I graduated high school with a firm conviction that I was going to make money doing music because of the exposure to music I received during high school. Following this same concept, if more students were exposed to computer science in high school, it would result in a greater influx of computer science majors to Utah colleges and in turn would help fill the numerous jobs available.

What would be appealing about computer science to high school students anyway? For starters, the average annual salary of a software developer during 2012 according to the Bureau of Labor Statistics was $93,350. To put that in comparison, the average salary of an optometrist is $97,820. Software developers only go to school for 4 years, optometrists go for 8 (“Summary”). Never in history has such a high paying job been available to those with anything less than Doctorate degree. According to Dan Watson, who is the department head at Utah State University for computer science, not only do computer science majors have the highest graduating pay at USU, they always get the jobs. He explained, “This year at [the USU] STEM fair, there will be over 50 employers looking to hire computer science majors and there will only be 49 graduates attending the fair. You do the math.”(Watson) With the allure of high pay and high demand, it’s difficult to understand why more of an emphasis isn’t made on computer science at an early age and why not a single state currently requires computer science courses (Cameron).

Computer science at a college level can be very difficult to the underexposed student, which is another great example of why getting experience early on is so important. 1000 lines of perfect code can be ruined by 1 misplaced semi-colon. This can be a very discouraging issue in a fast-paced college environment. The benefits of small class sizes and one-on-one interaction between student and teacher cannot be overstated. These discouraging issues quickly become learning experiences as teachers help students overcome error in a controlled environment. High school computer science classes will give students the problem solving skills necessary in order to succeed at a college level.

While high school computer science programs are sparse in the United States it would be hard to structure a computer science curriculum, however similar programs have been implemented in other countries and have yielded impressive results. Take for example curriculum that was put in place in New Zealand. In 2011 a nation-wide requirement was put in place requiring secondary education students to take classes in computer science. While implementing such programs nation-wide would obviously come with challenges, it was very successful. The program layout focused more on the problem solving side of computer science than the syntax and organization of it. In a research done by Tim Bell with the Association for Computing Machinery they described the program as the following:

“The key-points are that “Programming and Computer Science” was introduced as an assessable subject for the final three years of high school… With the new content, a course on computer science can include topics like algorithms, HCI, formal languages, complexity and tractability, intelligent systems, software engineering, and graphics and visual computing, in addition to programming. Problem solving and creativity already permeate the New Zealand curriculum, and the new content gives students the opportunity and tools to be creative in new ways.” (Bell, 28)

It would be feasible to base programs in our high schools off of similar programs. That now begs the question, “How do we know this will work?”

It is clear that simply saying that computer science is now a requirement is not much of a plan. As it is whenever change is involved, there are always challenges that arise and the case would be no different when changing school curriculum as dramatically as I am proposing. These challenges, however, can be overcome if handled correctly. In the same research on the New Zealand curriculum change, many of those challenges were revealed and the solutions for those challenges were discussed. They found that the root of most of the issues that arose came from a general lack of understanding about what computer science really was (on the part of the students and the teachers). Adequately training teachers, not so much to be computer scientists but to teach computer science, would be key to the success of these programs. In the New Zealand research many reported that students joined the classes under the impression that they were going to learn computer skills such as typing, word processing, or spreadsheets. After one year teachers reported that nearly 44 percent of students that enrolled in the class lacked the skills necessary to succeed (Bell, 29). If our teachers don’t understand what computer science is then it would be difficult to help students understand the same. The solution to this problem was found by involving college students. They would have teachers work alongside computer science majors to help them gain an understanding (Bell, 30). They also created a dedicated email where teachers could email in and get quick responses to questions or doubts. They quickly found that once teachers understood what they were teaching, student understanding quickly followed.

So what is computer science then? Clearly computer science needs to be understood as much more than typing or doing Excel documents. Most schools already have classes that teach typing and other computer skills and are very valuable, however the goal of adding ”computer science” classes is more oriented toward problem solving and critical thinking as opposed to mechanical skills. Take for example a class focused on learning the language of C++. They would learn how to program things like a basic calculator or how to sort through a list of names and order them alphabetically. There really is no end the things they could do in these classes but it would be heavily focused on helping students solve the problems in their own way, because there could be 1000 solutions to the same problem.

While there are many solutions to the difficulty of changing curriculum I feel that there are other issues that would need to be addressed. Like stated before, I recognize that computer science can be very difficult. Parents and schools boards alike may wonder if students can handle the pressure of being required to take additional math heavy courses and still succeed in school. While yes, requiring computer science courses will put an increased work load on students, there is another edge to the sword. These classes would be designed to help students practice the math concepts they are already required to learn. Not only will it improve math competency, it will provide students with a real world application to those math concepts. How many times a year does a math teacher hear, “When are we ever going to use this stuff?” Computer science is a simple yet completely satisfying answer to that question. Michelle Lagos, who is a board member of the Computer Science Teachers of America (CSTA) says this about the difficulty of computer science:

“[The students] are experts at downloading apps, creating movies with iMovie or moviemaker, and downloading songs from YouTube (copyright infringement is whole separate topic). I do not want to discredit these skills or applications, but my [students] are also completely capable of coding or designing their own games. We just have to give them a chance!”(Lagos)

Sometimes I feel like we fail to remember that graduating high school is not the end goal. Eventually students will graduate and go to college. Isn’t this really the goal of our high schools, to prepare the students so that they have a successful college experience? Additionally, we don’t want our students to stop at college. They should go on and have a career. Like mentioned before the average salary of software developers in 2012 was $93,350 (“Summary”). This is one of the highest paying careers for the amount of education required, and with over 7000 employers looking to hire computer science majors on a regular basis it is hard to think that students wouldn’t want to pursue this field, yet Utah colleges only produce around 500 computer science graduates every year. We simply are not providing high school students the experience necessary to succeed in computer science at a college level.

Some may think that this experience could be obtained elsewhere. There are so many places on the internet that offer to teach programming for free. CodeAcademy.com and Code.org are just a few examples of such sites. I do not want to downplay the usefulness of sites like these. I started learning code by starting an account on codeacademy.com. It did an excellent job of teaching people to code and not just teaching about coding. While there are many benefits to using these types of sites there is one big drawback. The issue with these websites is the inability to of learners to ask questions. Having someone in the same room with you is an irreplaceable necessity in nearly any learning atmosphere be it music, math or computer science. Having a teacher in the room to answer questions, guide and direct students is key to helping students persevere through the difficult beginning stages of computer science. I can’t remember how many times I nearly quit because of the difficulty I had grasping some of the concepts that were being taught online, but when I finally entered a formal classroom I found the solutions to those problems in a matter of seconds. Having classes in high school combined with such online tools would be a highly successful combination.

Other concerns may arise about the cost of implementing such programs. Teachers would have to be hired that is true, but these teachers will have a knowledge base that would extend much beyond teaching. They would have the skills necessary to troubleshoot and fix issues with school computers. They would maintain and support school or district websites and applications. They could also double as network administrators. Their usefulness doesn’t end in the classroom. The other expense that may arise would come in the form of equipment or software. Depending on the current status or age of school computers, new computers may be necessary, but the computers required for doing what high schools students would be developing for their classes would be far less than fancy. Similarly, excellent software is often available for free for educators and students so the out of pocket costs would be minimal.

I will be the first to recognize that computer science may not be for everyone, and while knowing how computers work is an essential skill not everybody will graduate from high school with dreams of being software developers. Someone asked me once why students needed to be software developers and my simple answer was, they don’t. The goal of adding these courses is not to convince everybody that computer science is the best field to go into, but to encourage them to consider it as an option. There most certainly could be those who are simply not going to be good at developing software. Something that could be done to accommodate those students would be to offer computer science courses and allow them to count for a core math or science credit. However, ultimately the goal should be that computer science be something that is required. Many undergraduate programs at Utah State University are now requiring computer science classes. Mechanical engineers, electrical engineers and even many business degrees are a few examples.

By implementing requirements in computer science, Utah schools will lead the nation into a new age of education. Their influence will spread and cause similar changes to curriculum in schools across the country. Utah employers will at last be provided with the skill sets needed to move their technology forward. All this, because of a small seed planted in our high schools.

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